

REMARKS

This Amendment is in response to the Office Action dated August 29, 2005.

In this amendment, Claims 1 and 5 are amended, and new Claims 17-28 are added. Upon entry of this Amendment, Claims 1, 3, 5-6, 9-12 and 17-28 are currently pending. These amendments are supported by the specification, figures and/or original claims. For example, support for new Claims 17-28 can be found on pages 6, 8-9, 11, and 13-16 of the specification and in FIGS. 3A, 5, and 6A-6B of the drawings. Applicant respectfully submits that this amendment does not introduce new matter.

The Examiner rejects Claims 1, 3, 5, 6 and 9-12 under 35 U.S.C. §103(a) as unpatentable over Kawakami Soichiro (JP61-37969). Applicant traverses this rejection and respectfully submits that the amended and newly added claims are patentable over the cited reference.

Soichiro discloses a CVD system including a cathode 1 having a cylindrical portion fixed to a cathode support plate 4. The space within the cathode 1 is provided with three partitions 2, 3, and 62, disposed coaxially with the cathode 1 and fixed to the cathode support plate 4. The partitions form buffers 18, 19, and 20 for the active reaction gas. The peripheral walls of cathode 1, partition 2, and partition 3 are provided with openings 13, 14, and 15, respectively, which are disposed at regular intervals in the peripheral and axial direction. The openings 13, 14, and 15 are formed such that their axes do not coincide with each other. So, the gas admitted through the openings from a preceding buffer always impinges on the external peripheral wall surfaces of the subsequent buffer, creating a diffusion effect to spread the gas in the subsequent buffer.

Claim 1 recites a gas delivery metering tube comprising an innermost tube having one or more array of orifices, and an outermost tube having one or more arrays of orifices and forming an effective annular space with the innermost tube. Claim 1 includes, among other things, the limitations that an effective diameter of the effective annular space is within a factor of three of an inner diameter of the innermost tube, and that a total cross sectional area of a plurality of orifices in the outermost tube is equal to or less than one tenth of a surface area of the outermost tube, such that the delivery of the gas out of the orifices in the outermost tube is substantially uniform along the substantial length of the outermost tube over a range of operating conditions.

As recognized by the Examiner, Soichiro does not teach these limitations. The Examiner nonetheless rejected Claim 1, asserting that motivations to vary the dimensions of the gas

delivery metering tube or to vary the distribution or the dimension of the orifices is to deliver process gases uniformly from the peripheral wall of the cathode. Such a motivation, however, is not found in Soichiro. In Soichiro, uniformity of gas flow out of the electrode 1 is achieved by the pinball-like mechanism of having the gas admitted through the openings from a preceding buffer impinge on the external peripheral wall surfaces of the subsequent buffer, creating a diffusion effect to spread the gas in the subsequent buffer (Translation: page 7, middle of 4th paragraph). This pinball-like mechanism would not demand an upper limit on the buffer space for better uniformity. On the contrary, a bigger buffer space would produce better uniformity in Soichiro because it would allow the gas to spread out more easily by diffusion effect. Therefore, the Examiner's position that Soichiro motivates one skilled in the art to restrict the size of any of the buffers 18, 19, 20 in order to achieve better gas distribution uniformity is without merit.

The Examiner's rejection of Claim 1 is further based on the statement that it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art, citing *Gardener v. TEC systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); and *In Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976), which are discussed in MPEP 2144.04.

In *Gardener v. TEC systems, Inc.*, the court ruled that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. Contrary to the situation in *Gardener*, however, the relative dimensions recited in Claim 1 are important features for the claimed gas metering tube because delivering the gas uniformly along the gas metering tube is achieved by achieving uniform pressure in the annular space, which is established by the size of the annular space (Specification, page 8, lines 22-24). Consequently, a gas metering tube without such limitations would not achieve the same uniformity in gas delivery as the claimed device. Therefore, *Gardener* cannot be relied up in rejecting Claim 1.

In *re Rose*, claims directed to a lumber package "of appreciable size and weight requiring handling by a lift truck" were held unpatentable over prior art lumber packages which would be lifted by hand because limitations relating to the size of the package were not sufficient to patentably distinguish over the prior art. In *re Rinehart*, "mere scaling up of a prior art process

capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled.” Here, however, the difference between the gas delivery metering tube of Claim 1 and the cathode in Soichiro is not only in their overall sizes, or the scaling up of the corresponding parts, but is in at least the relative dimensions of the parts, which relative dimensions are discussed in the specification in terms of optimum workable ranges for obtaining the desired results. Therefore, neither *In re Rose* nor *In re Rinehart* can be relied upon to reject Claim 1.

It has been established that a particular parameter must first be recognized in the prior art as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable range of said variable might be characterized as routine experimentation (MPEP 2144.05 II. B.). *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977), the claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq.ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.

Similarly, in the present case, Soichiro does not suggest, either implicitly or explicitly, any effect of the cross sectional areas of the buffer between a previous and a subsequent partitions, or any effect of limiting the total cross sectional area of the openings in any of the partitions, on the uniformity of the flow of the gas out of the electrode 1. The only dimensional requirements in Soichiro are that the preceding/subsequent ratio for the diameters of the openings 13, 14, and 15 should be kept between 10:1 and 3:1 to allow the above pinball-like mechanism to work. These requirements are very different from those recited in Claim 1 because, firstly, they do not relate at all to the cross sectional areas of the buffers, and secondly, they only limit the size of each individual opening on a partition based on the size of the openings in a previous and or subsequent partition and do not touch upon the total cross sectional area of the openings on a partition. Therefore, it cannot be obvious, without any hindsight, for one of ordinary skill in the art to determine the optimal ranges recited in Claim 1 based on the teachings of Soichiro.

Therefore, Claim 1 as amended is patentable over Soichiro.

Claims 3, 5-6, and 9-12 depend from Claim 1 and are therefore patentable for the same reasons as Claim 1 and for the additional reasons set forth therein.

New Claim 17 recites:

A gas delivery metering tube, comprising:
an inner tube having an open end, a capped end opposite the open end, and a first array of orifices distributed along a substantial length of the inner tube between the open end and the capped end, the inner tube being configured to allow introduction of a gas into its entire inner volume from the open end and to provide an outflow of the gas through the first array of orifices; and
an outer tube nested and axially aligned with the inner tube so that an annular space is formed between the inner and outer tubes to receive the outflow of the gas from the inner tube, the outer tube including a second array of orifices distributed along a substantial length of the outer tube, the second annular space being sized and the second array of orifices being sized and numbered to achieve substantially uniform gas pressure in the annular space and an outflow of the gas through the second array of orifices that is substantially uniform along the substantial length of the outer tube for a range of operating conditions.

New Claim 17 is patentable over Soichiro because Soichiro does not disclose an inner tube having an open end and a capped end opposite the open end. In Soichiro, neither ends of the partition 3, which the Examiner has analogized as the inner tube, is an open end. As shown in FIG. 1 and stated on page 6 of the specification in Soichiro, partition 3 is fixed to the cathode support plate 4, which closes that end of partition 3 leaving only a small hole to allow a pipe 5 to extend into the interior of partition 62. The other end of partition 3 is also closed (FIG. 1). Furthermore, unlike the inner tube in Claim 17, partition 3 is not configured to allow introduction of a gas into its entire inner volume from one of its ends. As shown in FIG. 1 and stated on page 6 of Soichiro, the active reaction gas is fed into buffer 20 through the pipe 5 that extends into the cathode 1 and opens into a tube 63, which is disposed horizontally inside the partition 62 with its two ends opening into the buffer 20. Thus, instead of being introduced into the entire volume of partition 3, the reaction gas in Soichiro enters the interior of partition 3 through the pipe 5 and is diverted toward buffer 20 by the tube 63, leaving some portions of its entire volume, such as the portion of the interior of the partition 62 above the tube 63, not accessible by the gas flow.

In addition, Soichiro also does not disclose or teach an outer tube forming an annular space with the inner tube and including an array of orifices, where the annular space is sized and the array of orifices are sized and numbered to achieve substantially uniform gas pressure in the

annular space for a range of operating conditions. Soichiro attempts to obtain uniform flow of the reaction gas out of the cathode 1 using the pinball-like mechanism discussed above, and never mentions the need to keep the pressure in the annular space uniform or the idea of achieving such pressure uniformity by limiting the size of the annular space and by limiting the size AND the number of the orifices on the cathode 1 or any of the partitions 2 and 3.

Therefore, new Claim 17 is patentable over Soichiro.

New Claims 18-28 depend from Claim 17 and are therefore patentable for the same reasons as Claim 17 and for the additional reasons set forth therein.

For example, new Claim 18 is patentable for the additional reasons that the first array of orifices are sized and numbered to establish a substantially uniform backing pressure within the entire inner volume of the inner tube despite the introduction of the gas at the open end and the outflow of the gas along the substantial length of the inner tube, which, without the size and number limitations on the first array of orifices, are likely to cause the gas pressure in the inner tube to decrease substantially from the open end to the capped end. Soichiro does not teach or suggest limiting the size and number of the openings 15 in the partition 3 to establish a substantially uniform backing pressure within the entire inner volume of the partition 3. The only teaching in Soichiro regarding the size of the openings 15 is that the size of the openings 15 should be 3 to 10 times larger than the size of the openings 14 in the subsequent partition 2.

To avoid its prior art problem that the reaction gas out of tube 63 tend to come out more through some of the openings 15 that are near the openings of the tube 63, Soichiro uses the outer partition 2 and the cathode 1 to create the aforementioned pinball-like actions to spread the gas along the walls of the partitions. Soichiro never attempted to even out the gas pressure within the partition 3 so that the gas flow out of the partition 3 is substantially uniform in the first place. Furthermore, because of the inclusion of partition 62 inside partition 3, which exclude the reaction gas from reaching a large portion of the entire inner volume of partition 3, Soichiro can never establish a substantially uniform backing pressure within the entire inner volume of the partition 3 as recited in Claim 18. Therefore, Claim 18 is patentable over Soichiro.

New Claim 22 is patentable for the additional reasons that the first array of orifices and the second array of orifices are rotationally offset by about 180 degrees from each other. Thus, Claim 22 calls for the first array of orifices being centered at one side of the gas delivery

metering tube while the second array of orifices are centered at about the opposite side of the gas delivery metering tube. In Soichiro, the openings 13, 14 and 15 are disposed at regular intervals in the peripheral and axial directions. Thus, the openings 13 cannot be offset from the openings 14 by about 180 degrees. Therefore, new Claim 22 recites additional structural features not taught by Soichiro and should be patentable over Soichiro for at least the additional features.

New Claim 27 is patentable for the additional reasons that the sizes of the plurality of orifices in the inner tube are smaller than the sizes of the plurality of orifices in the outer tube. This is contrary to the teachings of Soichiro, which recommends that the inner openings to be at least 3 times as big as the outer openings. This difference between the claimed invention and the teachings of Soichiro is due to the fact that the claimed invention uses a different mechanism than the one taught in Soichiro to achieve uniform outflow from the cathode. Soichiro relies on the pinball-like actions to spread the gas out, which would require the outer openings to be smaller than the inner openings to give the gas molecules more chance of bouncing between the partitions before exiting the cathode. In contrast, the claimed invention attempts to establish uniform backing pressure in the inner tube and thus prefer a smaller size for the orifices in the inner tube for that purpose, which is not recognized at all in Soichiro. Therefore, new Claim 27 is patentable over Soichiro.

Based on the foregoing, Applicants respectfully submit that the application is now in condition for allowance. If any matters can be resolved by telephone, the Examiner is invited to call the undersigned attorney at the telephone number listed below. The Commissioner is authorized to charge any additional fees to Deposit Account No. 50-2319 (Order No. A-67178/MSS (463035-409)).

Respectfully submitted,
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